Case Report Rapport de cas

Magnetic resonance imaging in the diagnosis of type 1 dermoid sinus in two Rhodesian ridgeback dogs

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Abstract — Two cases of type 1 dermoid sinus in Rhodesian ridgebacks are described, with emphasis on the use of magnetic resonance imaging (MRI) in the diagnosis and delineation of the lesions. Magnetic resonance imaging was useful in identifying fluid-filled structures, fibrous capsules, and sinus tracts, but was not able to identify the termination of the tracts.

Résumé — L'IRM dans le diagnostic du sinus dermoïde de type 1 chez 2 chiens Rhodesian ridgeback. Cette étude décrit 2 cas de sinus dermoïdes de type 1 chez des chiens Rhodesian ridgeback et met l'accent sur l'utilisation de l'imagerie par résonnance magnétique (IRM) dans le diagnostic et la localisation des lésions. L'IRM a été utile pour identifier les structures remplies de liquide, les capsules fibreuses et les voies sinusales mais n'a pas permis d'identifier la terminaison des voies.

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Dermoid sinus is a tubular skin indentation that occurs more frequently in pure (1–7) and crossbred (8) Rhodesian ridgeback dogs. The disease has occasionally been reported in shih tzus (9), boxers (9), Yorkshire terriers (10,11), chow chows (12), Siberian huskies (13), English springer spaniels (14), and golden retrievers (15), among other breeds. The sinuses, in general, are present from the dorsum of the neck to the sacral area (16) in Rhodesian ridgeback dogs. Single (1,2,4,5,8) or multiple tracts (3,12) extend from the skin surface to a variable depth. Considering that there is little information concerning the magnetic resonance imaging (MRI) appearance of dermoid sinus (7,11), the aims of this study were to use MRI to assess the extent of type 1 dermoid sinus at the cervical region in 2 Rhodesian ridgeback dogs, and to describe the treatment.

Case descriptions

Case 1

A 1-year-old, 35-kg, intact female Rhodesian ridgeback dog was admitted for evaluation of swelling in the caudal dorsal cervical area (Figure 1A) first observed at 9 mo of age. According to the owner, the lesion was enlarging progressively, but no discharge was observed. This was the only dog affected in a litter of 2 pups. Physical examination revealed 2 nonpainful fluctuant masses associated with a firm cord extending ventrally into the neck musculature. A small opening on the skin surface of the dorsal cervical area was observed after clipping. An MRI scan of the cervical area was performed under dissociative anesthesia with the dog positioned in ventral recumbency. Images were made using a GE MRI Signa (General Electric, USA) with a magnetic field strength of 0.5 Tesla. A sagittal view of T-1 and transversal view of T-2 weighted sequences, and a sagittal view of short-time T1 inversion recovery sequences (STIR) were acquired. The T1-weighted scan sequences were obtained with a repetition time (TR) of 500 ms and an echo time (TE) of 15 ms; T2-weighted scan sequences were obtained with a TR and a TE of 4000 ms and 94.5 ms, respectively. The field of view was 25.9 mm, and slice thicknesses were 3 mm for transverse scans and 6 mm for sagittal scans.

An elliptical structure of 3.2 × 1.2 cm was observed subcutaneously on the sagittal (Figures 1B and 1C) and transversal (Figures 2A and 2B) views. It had an intermediate signal (gray) in its lumen suggesting fluid, and a hypointense signal (dark) in its periphery, consisting of a fibrous capsule. The tract with the intermediate signal was also observed in another slice on the sagittal and transversal views (Figures 1C and 2B). In the STIR images, a hyperintense signal (bright) was seen in the elliptical structure and in its tract (Figure 1D). The tract extended from the subcutaneous tissue to the neck muscle, and its termination was not clearly outlined (Figure 1C). However, the cervical spine had no sign of involvement with the tract according to the T1-weighted scan sequences (Figure 3).

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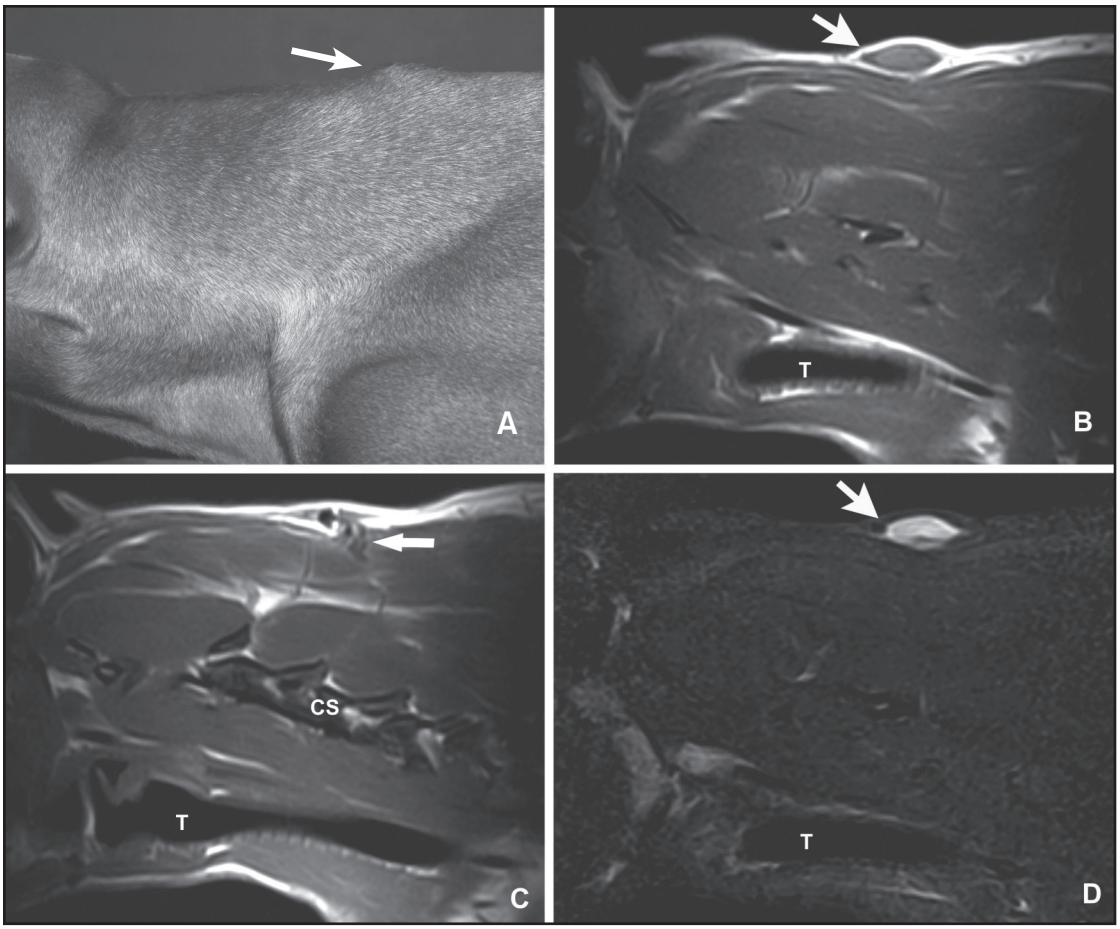

Figure 1. Dermoid sinus in a 1-year-old Rhodesian ridgeback dog. A – Lesion on the dorsal aspect of the neck (arrow). B – Sagittal T-1 weighted magnetic resonance image (MRI) showing elliptical structure with intermediate signal in its lumen (arrow). C – Sagittal T-1 weighted MRI showing elliptical structure with intermediate signal and its tract with hypointense signal (arrow). The cervical spine (CS) is visible. D – Sagittal STIR image showing hyperintense signal of the elliptical structure (arrow) and its tract. The trachea (T) is shown in B, C, and D.

Under general isoflurane (Isoforine; Cristália, Itapira, Brazil) anesthesia, the dog was positioned in ventral recumbency and the dorsal cervical area was aseptically prepared for surgery. An elliptical incision was made around the external opening of the sinus. Blunt dissection through the subcutaneous tissue revealed 2 cyst-like structures connected with an approximately 3–5-mm diameter tract (Figure 4A). The sinus tract was followed as it extended ventrally between the dorsal cervical muscles (Figure 4B). It was resected from the attachment to the nuchal ligament. The retracted muscles were apposed with simple interrupted sutures and the subcutaneous tissue with a simple continuous pattern using suture of 3-0 polyglactin. The skin incision was closed using simple interrupted sutures of monofilament 2-0 nylon. Ceftriaxone (Rocefin; Roche, Rio de Janeiro, Brazil) was administered at a dose of 25 mg/kg BW, IV q24h immediately before and for 5 d after the surgical procedure. Meloxicam (Maxicam; Ouro Fino, Ribeirão Preto, Brazil) 0.1 mg/kg BW, PO, q24h was administered postoperatively for 5 d. A type 1 dermoid sinus was the diagnosis.

The sinus was filled with sebaceous material mixed with hair (Figure 4C). Histologically, an extensive tubular structure lined with stratified squamous epithelium and filled with lamellar keratin, cellular debris, hair, and sebaceous secretion was observed. Concentric layers of collagen fibers surrounded the tubular structure peripherally. There were hair follicles and sparse sebaceous glands among these fibers.

Case 2

A 5-month-old, 20 kg, intact female Rhodesian ridgeback dog was presented for evaluation of a single nonpainful swelling located on the dorsal midline of the caudal cervical area. This condition had been observed when the dog was 1.5-months-old; all 9 littermates were normal. According to the owner, this case and case 1 had had the same dam and different sires; none of which was clinically affected. A fluctuant mass followed by a thin cord was subcutaneously palpated on physical examination. After clipping the area, 1 small opening on the skin surface was observed (Figure 5A).

An MRI study of the cervical area was performed using the same protocol as that used for case 1, but the STIR sequences were not included. The T1-weighted scan sequences were obtained with a TR of 500 ms and a TE of 22 ms, and the T2-weighted scan sequences were obtained with TR and TE of 4000 ms and 91 ms, respectively. The field of view was

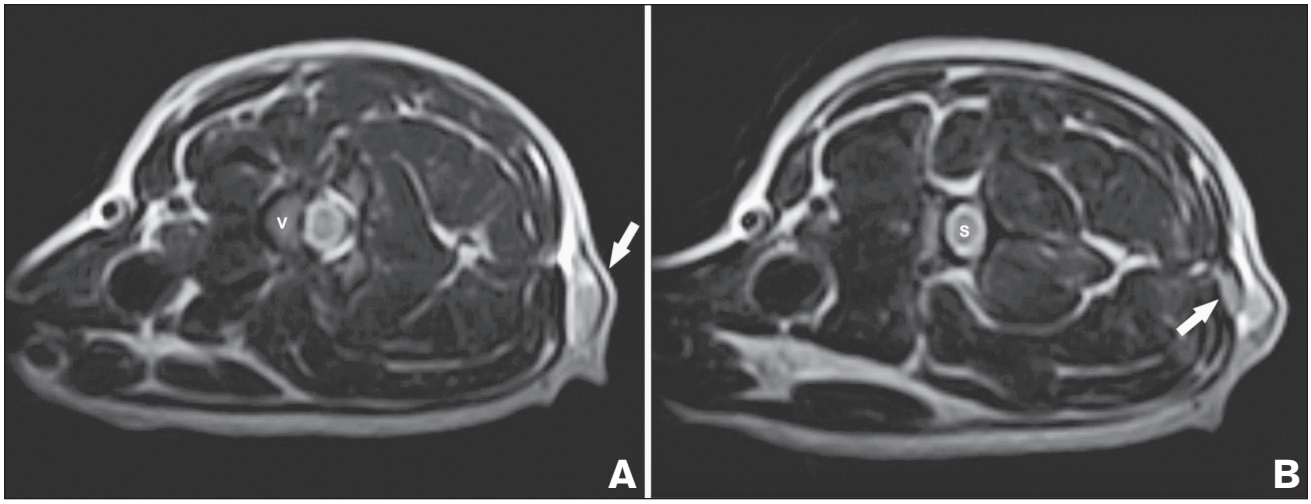

Figure 2. Dermoid sinus in a 1-year-old Rhodesian ridgeback dog. Transversal T-2 weighted magnetic resonance images showing rounded structure (arrow) with intermediate signal in its lumen (A,B), and its tract (white arrow) (B). Observe also the vertebrae (V) and spinal cord (S).

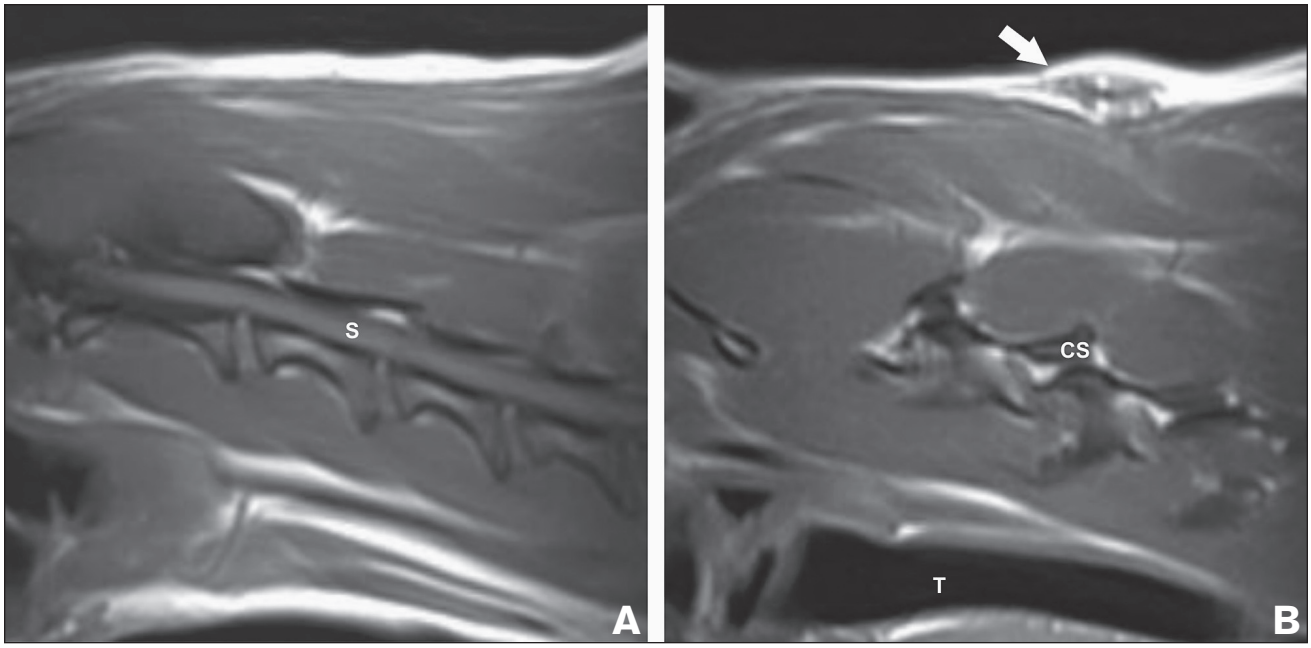

Figure 3. Dermoid sinus in a 1-year-old Rhodesian ridgeback dog. A – Sagittal T-1 weighted magnetic resonance image showing the cervical spine with no sign of involvement with the tract. Observe the spinal cord (S). B – Another sagittal T-1 weighted slice showing the elliptical structure (arrow). Observe the cervical spine (CS) and trachea (T).

25.9 mm, and slice thicknesses were 2.7 mm for transverse scans and 3 mm for sagittal scans. On both the sagittal (Figure 5B) and transversal views, a round structure of 0.4 × 0.3 cm with intermediate signal in its lumen suggesting fluid was observed. The lesion was continuous with a tract that extended from the subcutaneous tissue to the neck muscle. The tract's termination could not be clearly outlined, and, as in case 1, the vertebral column had no involvement with the tract.

The dermoid sinus was surgically excised using the same procedure as that used in case 1. Surgical findings were similar, except that there was only 1 cyst-like structure connected with an approximately 3-mm diameter tract (Figure 5C). The diagnosis was type 1 dermoid sinus.

On cut section, the sinus was filled with hair projecting from the skin surface in the lumen (Figure 5D). Histopathological examination of the resected tissue revealed a tubular structure located in the dermis, with a thick wall composed of an internal epithelial layer and peripheral fibrous connective tissue (Figure 6). The internal layer was composed of stratified squamous epithelium that showed keratinization. Lamellar keratin, cellular debris, hair, and sebaceous secretion were observed in the lumen. Collagen fibers, roughly parallel to the wall of the tubular structure, surrounded the epithelial layer. At the same site, hair follicles of normal structure, but reduced size, were distributed radially. In addition, sebaceous glands associated with the wall of the sinus were observed. The sebaceous follicle

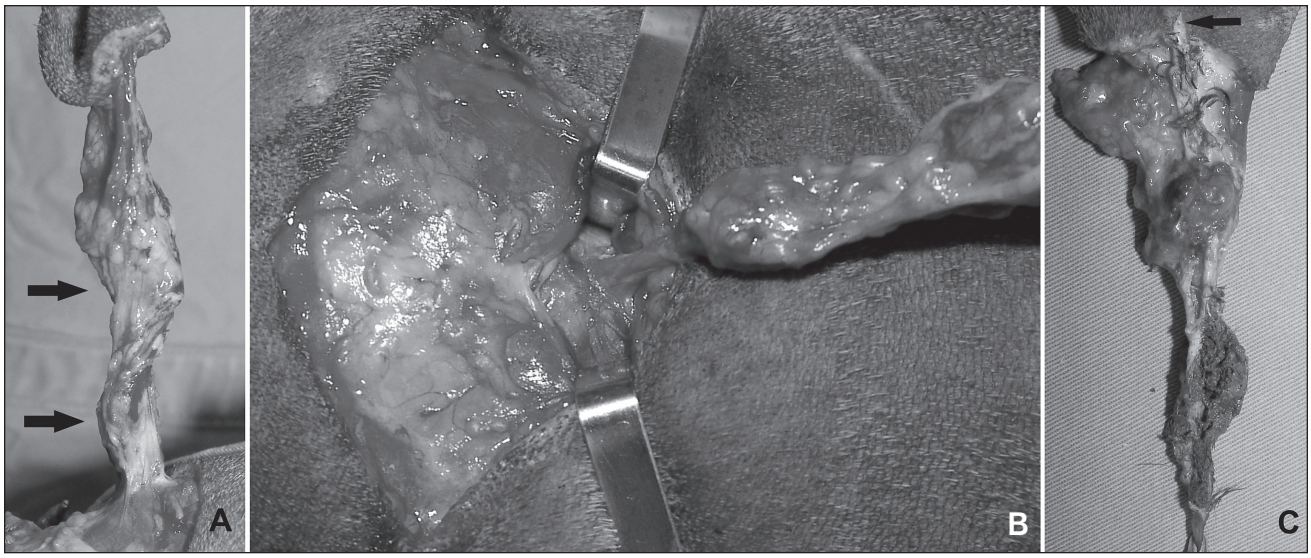

Figure 4. A – Surgical removal of the dermoid sinus in a 1-year-old Rhodesian Ridgeback dog. Observe the cyst-like structures (arrows). B – Sinus tract extending ventrally between the dorsal cervical muscles. C – Longitudinal section of the excised tissue showing the sinus filled with sebaceous material mixed with hair. Observe the opening on the skin surface (arrow).

units were sparse, and few areas showed discrete mononuclear perivascular infiltration.

Discussion

The dermoid sinus in Rhodesian ridgebacks is a congenital defect caused by incomplete separation between the skin and spinal cord, after closure of the embryonic neural tube (16). Several modes of inheritance have been proposed, but the exact mechanism is not established (1,16,17). One study concluded that the ridge is an autosomal dominant trait that predisposes for dermoid sinus (18). In the cases herein, the parents were phenotypically normal, but both dogs had the same mother. Since the littermates were normal, each parent probably carried a recessive gene.

Clinical signs occur if the sinus becomes inflamed or drains to the exterior (3–5,12,13,15), and small tufts of hair may protrude from the sinus opening (1,4,9,14). Neurological signs generally develop when the sinus is continuous with dura mater and becomes infected (1,9,10,11,14). Since the dogs in the present report had no discharging tract, the owner only observed subcutaneous swelling. The detection of the external opening was possible only after shaving the area over the sinus, although the tract was easily identified by palpation.

The dermoid sinus has been classified according to penetration depth: type 1 ending on the supraspinous ligament or nuchal ligament to which it is attached; type 2 is more superficial than type 1, but is connected to the supraspinous ligament by a fibrous strand; type 3 does not extend as far as the supraspinous ligament and is not attached to it; type 4 extends to the spinal canal and is attached to the dura mater (16,17); and type 5 is described as a dermoid cyst in which there is no opening or tube running towards the skin surface, but a closed epithelium-lined sac or capsule (6,7,12,16,17). Macroscopically and histologically, cases 1 and 2 were diagnosed as type 1 dermoid sinuses.

The identification of dermoid sinus tract depth may be challenging. Among the methods used for diagnosis are fistulograms (1,3,5,9,14,15), myelograms (9,10), ultrasound (8), computed tomography (10), and MRI (7,11). Magnetic resonance imaging, a noninvasive method that does not use ionizing radiation, was used herein to study the dermoid sinus, as it provides more soft tissue detail than ultrasonography (19). The disadvantages of this technique include high cost and the need for general anesthesia.

In both cases, the MRI was useful for evaluating the characteristics of the cyst-like structure, but it was not able to demonstrate the exact path of the sinus. In most diagnostic imaging studies the skin is maintained in the normal position. However, on physical examination, the trajectory of the sinus in the subcutaneous tissue is better felt during palpation when the skin fold is raised (1,16). This was probably why the MRI was not able to show clearly the termination of the sinus tract, and showed only 1 cyst-like structure in case 1. There is 1 reported case of dermoid cyst in which the images obtained from MRI studies were confusing and complicated the surgical exploration (7).

In general, myelograms (9,10), computed tomography (10), and MRI (7,11) were used in cases presenting neurological signs. Although, the dogs in the present cases did not show neurological signs, MRI was useful to exclude extension of the sinus into the vertebral column. The T1-weighted and T2-weighted images are usually used in most examinations (20). The T1-weighted images are useful for examining anatomic detail, and the T2-weighted images provide high contrast for several pathological findings. Tissue suppression, a more sophisticated image acquisition technique, allows improved tissue contrast and enhanced detectability of the lesion (20,21). Fat and water are the most commonly suppressed in clinical

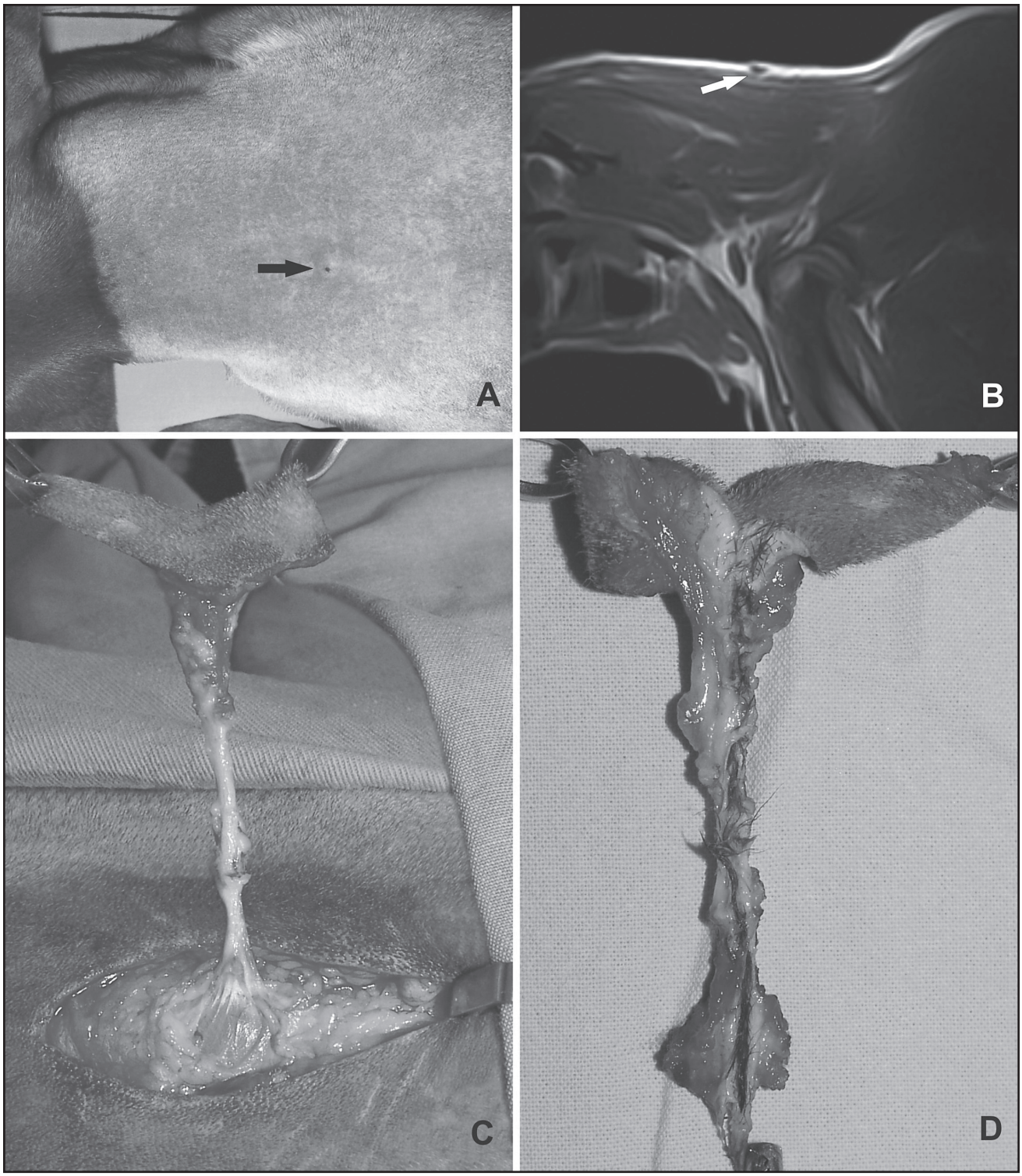

Figure 5. Dermoid sinus in a 5-month-old Rhodesian Ridgeback dog. A – The tract opening (arrow) on the dorsal cervical region, visible after clipping. B – Sagittal T-1 weighted magnetic resonance image of the cervical area showing a rounded structure with intermediate signal in its lumen suggesting fluid (arrow). C – Surgical removal of the sinus tract. D – Gross section of the excised sinus with hair in the lumen.

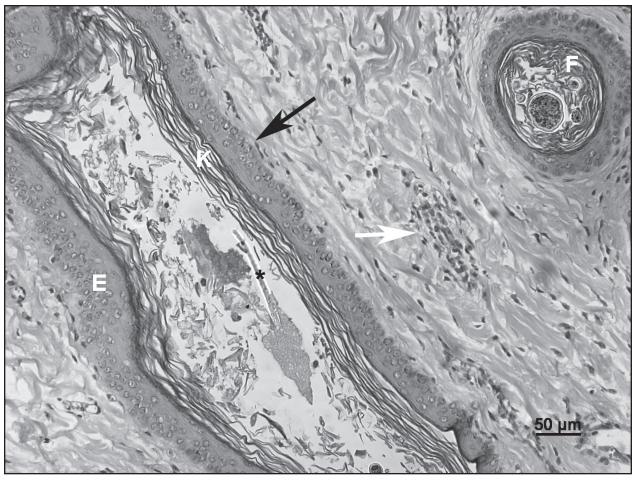

Figure 6. Photomicrograph of a section of the dermoid sinus showing a tubular structure (arrow) lined with internal epithelial layer (E) and filled with lamellar keratin (K), cellular debris, and hair (*) and sebaceous fluid. Hair follicles (F) and perivascular infiltrate (white arrow) were observed peripherally. Hematoxylin and eosin. Bar = 50 µm.

practice (21). The STIR imaging used in case 1 to eliminate signal from fat demonstrated a hyperintense signal. This finding was consistent with the histological examination that showed sebaceous secretion into the lumen as well as lamellar keratin, cellular debris, and hair.

Due to this predisposition, Rhodesian ridgeback dogs must be screened for the condition from birth (16,17). Owners should be advised to neuter affected individuals to reduce the occurrence of the disease (4,16).

Authors' contributions

Drs. Rahal and Mortari were the veterinary surgeons. Drs. Morishin Filho and Hatschbac were the veterinary anesthesiologists. Dr. Sequeira was the pathologist and Dr. Yamashita the radiologist. Dr. Rahal wrote and reviewed the article. All authors were responsible for preparation of the article. CVJ

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